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09/357,507	07/20/1999	KIYOSHI TAGUCHI	10059-286	9338

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EXAMINER	
LEUNG, JENNIFER A	
ART UNIT	**PAPER NUMBER**
1764	

DATE MAILED: 11/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/357,507	TAGUCHI ET AL.
	Examiner	Art Unit
	Jennifer A. Leung	1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,4,6,8-10,21 and 23-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,4,6,8-10,21 and 23-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Response to Amendment

1. Applicant's amendment filed on August 16, 2004 has been received and carefully considered. Claims 2, 5, 7, 11-20 and 22 are cancelled. Claims 1, 3, 4, 6, 8-10, 21 and 23-28 remain active.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 6, 8-10, 21 and 25-28 are rejected under 35 U.S.C. 102(b) as being anticipated by James et al. (US 3,262,758).

Regarding claims 1 and 21, James et al. (FIG. 1, 2; generally, column 2, line 24 to column 3, line 60) disclose an apparatus comprising:

a reaction segment having a catalyst bed for oxidizing carbon monoxide (i.e., the annular space between containers **1** and **8**, comprising CO-oxidation bed **22**);

a reformed gas inlet (i.e., conduit **6** for introducing primary reformed gas stream **2**);

a reformed gas pathway for supplying reformed gas to the reaction segment **22** (i.e., indicated by solid-line flow arrows);

an oxidant gas supplying segment for supplying an oxidant gas to the reformed gas pathway (i.e., conduit 7 for introducing oxygen-containing gas stream **3**);

a cooler for cooling an upstream side of the catalyst bed **22** (i.e., the steam boiler section, located between partitions **18** and **19**, comprising conduit **13**, fire tubes **17** and heat exchange

medium supplied via **20** and removed via **21**; column 3, lines 25-41); and

means for heating a downstream side of the catalyst bed;

wherein the means comprises a portion of the reformed gas pathway located in proximity to and at least partially surrounding the catalyst bed **22**; the means being separated from the catalyst bed **22** by a wall (i.e., inner container wall **8**), so as to *inherently* heat the downstream side of the bed 22 by the reformed gas and *inherently* cool the reformed gas in the reformed gas pathway via the transfer of heat energy through wall **8** to the catalyst bed **22**, before passing through the cooler, via central conduit **13** and fire tubes **17** (column 1, lines 49-71; column 2, lines 57-70; column 3, lines 14-24 and 41-51).

Regarding claims 6 and 25, James et al. further discloses,

> "A stream of oxygen containing gas, such as air, is reacted with the primary reformed gas stream. When ammonia synthesis gas is produced, *a stoichiometric proportion of air is employed* in the secondary reform step to yield a final gas stream containing hydrogen and nitrogen in a 3:1 ratio. The combustion reaction which takes place due to oxygen addition *causes a rise in gas stream temperature* and some further conversion of hydrocarbon," (column 1, lines 30-38).

Thus, although a gas flow rate control valve is not illustrated in the figures or explicitly disclosed, such control means would be *inherent* of the apparatus, to the enable the disclosed control of a "stoichiometric proportion of air", which will in turn control the "rise in gas stream temperature" and correspond to a rise in the temperature of the catalyst bed **22**.

Regarding claims 8 and 26, James et al. (FIG. 1) discloses the reformed gas pathway (see solid-line flow arrows) has a first direction prior to passing through the cooler (i.e. via tube **13**) and a second direction passing through the catalyst bed **22**, wherein the first and second direction are opposing (column 3, lines 25-52).

Regarding claim 9, James et al. discloses the reaction segment is located outside the reformed gas pathway (i.e., CO-oxidation bed **22** being annular and having a central reformed gas pathway defined by inner container **8**; FIG. 1, 2).

Regarding claim 10, James et al. discloses the reaction segment is tube shaped (i.e., annular, CO-oxidation bed **22**; FIG. 1) and the reformed gas pathway before the passage through the cooler (i.e. tubes **13**, **17**) is formed around the reaction segment **22** (i.e., a portion of the gas stream may be *bypassed around the heat exchange section*, passing out of the lower end of conduit **3** via openings controlled by control dampers **14**," column 3, lines 14-24).

Regarding claims 27 and 28, James et al. discloses the portion of the reformed gas pathway (i.e., within inner chamber **8**) heats the catalyst bed **22** by direct heat transfer through the wall (column 1, lines 49-71; column 2, lines 58-71).

Instant claims 1, 6, 8-10, 21 and 25-28 structurally read on the apparatus of James et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 3, 4, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over James et al. (US 3,262,758) in view of Finneran et al. (US 3,345,136).

James et al. further discloses that in the CO-oxidation stage, "... the cooled gas stream is passed through *one or more beds of promoted iron oxide catalyst*, in order to react carbon monoxide with steam, thus yielding further hydrogen," (column 1, lines 47-49). However, James et al. is silent as to whether the "one or more beds" may be configured such that an upstream side portion of the catalyst is formed of a different catalyst material than the downstream side portion, and whether the catalyst comprising the downstream portion may exert an activity at a lower temperature than the catalyst material of the upstream side portion.

Finneran et al. (column 1, lines 34-61) teaches,

> "Regardless of the process for which the hydrogen is made, it is generally desirable that it contain a minimum of residual carbon monoxide," and
>
> "To obtain desirably low levels of residual carbon monoxide in the product gas and a corresponding high degree of conversion to hydrogen, the process can be carried out in *two stages*. In the first stage, the carbon monoxide containing gas is contacted in the presence of *a relatively inexpensive shift conversion catalyst active a relatively high temperatures* to convert the bulk of the carbon monoxide. The exothermic heat of the reaction and a substantial portion of the sensible heat of the partially shifted gas is removed by cooling. The cooled gas is then contacted in the presence of *a relatively more expensive shift conversion catalyst active a t relatively low temperatures* to produce additional hydrogen under equilibrium conditions which favor a low residual proportion of carbon monoxide."

Thus, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select the catalyst configuration as taught by Finneran et al. for the one or more beds of CO-oxidation catalyst **22** in the apparatus of James et al., because the selection of two catalyst stages, wherein an upstream catalyst stage is active at a relatively high temperature and the

downstream catalyst stage is active at a relatively low temperature, allows a substantial portion of the carbon monoxide to be converted to carbon dioxide, while producing the desirably low levels of residual carbon monoxide in the product gas and a corresponding high degree of conversion to hydrogen, as taught by Finneran et al., above.

Response to Arguments

4. Applicant's arguments submitted on August 16, 2004 have been fully considered but they are not persuasive.

Arguments with respect to JAMES et al.

Beginning on page 3, second to last paragraph, Applicants argue,

> "... the reformed gas pathway of James (through chamber **8** and catalyst bed **10**) does not "surround" in any way the catalyst bed **22**. Instead, it is on the inside of catalyst bed **22**, such that catalyst bed **22** surrounds the chamber **8** and catalyst bed **10**."

The Examiner maintains her rejection of claim 1, since the reformed gas pathway need only be "located in proximity to said catalyst bed and separated from the catalyst bed by a wall," (lines 8-11). Note that the "surround" feature upon which applicant relies is not recited in the rejected claim 1. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Additionally, the Examiner maintains her rejection of claim 21, since the reformed gas pathway need only to "*partially* surround said catalyst bed," (line 9). As illustrated in FIG. 1, the reformed gas pathway runs from inlet **6** to outlet **25**, wherein the pathway partially surrounds catalyst bed **22**, for instance, at its upper surface. Note that the feature of a reformed gas pathway that *completely* surrounds the catalyst bed **22** is not recited in the rejected claim **21**. Alternatively, one could also argue that the reformed gas pathway does

completely surround catalyst bed **22**, since the reformed gas stream inherently flows through the interstices of catalyst bed **22** within the annular region of the reactor, and therefore "encompasses" the catalyst bed **22**.

Beginning on page 4, second paragraph, Applicants argue,

> "... James does not intend for the wall of chamber **8** to be a heat transfer wall. Instead, he attempts to avoid such heat transfer by lining the chamber **8** with refractory lining **9**."

The Examiner respectfully disagrees. Despite whether or not James intended for heat to transfer through the wall of chamber **8**, the Examiner maintains that the refractory lined wall of chamber **8** will inherently heat the downstream side of the catalyst bed **22**. James specifically addresses this assertion by disclosing,

> "... the bed of CO-oxidation catalyst *acts as a temperature moderator and serves as insulation* to protect the outer container from the high temperature maintained in the secondary converter section." (column 1, lines 57-61; also, column 2, lines 13-16).

Heat is necessarily transferred through the refractory lining **9** and the wall of chamber **8**, in order for the bed of CO-oxidation catalyst **22** to exhibit its disclosed temperature moderating and insulating characteristics.

The generally known nature of heat transfer in refractory materials is evidenced by White. White discloses an apparatus for heating a heat transfer fluid, such as water, wherein the apparatus comprises a wall including a refractory layer **9** that separates a higher-temperature firebox **4** from a lower-temperature water jacket **13** (FIG. 2). In particular, White (page 7, line 17, to page 8, line 8) teaches that,

> "... due to the nature of refractory layer **9** significant heat build-up may be achieved within the layer **9** over prolonged periods whereby layer **9** then functions as a heat reservoir wherein heat may be transferred to the water contained within the water jacket

> **13** adjacent the layer **9** thereby providing a secondary region of heat transfer, i.e. a pre-heating area."

One having ordinary skill in the art would recognize that the refractory lining **9** in the apparatus of James would exhibit heat transfer characteristics similar to the refractory lining **9** in the apparatus of White. In the apparatus of James, significant heat build-up would similarly occur within the refractory layer **9** over prolonged periods, whereby layer **9** would then function as a heat reservoir wherein heat may be transferred to the adjacent stainless steel wall of chamber **8** and subsequently into the adjacent layer of catalyst **22**, thereby creating a heating means for the downstream side of catalyst **22** and causing the catalyst **22** to exhibit its temperature moderating and insulating characteristics.

Beginning on page 4, third paragraph, Applicants argue,

> "... it cannot be said that the temperature of the catalyst bed **22** necessarily increases from the upstream side to the downstream side, i.e., is heated at the downstream side... there are some cases where the temperature increases from the downstream side to the upstream side of the catalyst bed **10**. In such a case, the catalyst bed **22** could be heated at the upstream end and cooled by heat lost from the catalyst bed **10**. Therefore, the Examiner's contention of inherency is again incorrect, because heating and cooling alleged by the Examiner do not necessarily occur in the James apparatus."

The Examiner respectfully disagrees. As disclosed by James (column 2, lines 58-70),

> "The mixed process gases react in the combustion chamber. The resulting combustion will raise the process gas stream temperature from 1300° F. to about 2000° F. The hot gas stream now rises from chamber **4**, passing to inner container **8** provided with refractory lining **9**... Bed **10** will typically be at a temperature of about 1650° F., and final catalytic conversion of unreacted hydrocarbon in the gas stream thus is accomplished in bed **10**."

Looking now to FIG. 1, the first region located immediately upstream of bed **10** within chamber **8** thereby contains process gas at about 2000° F. The second region within bed **10** between

retention means **11** and **12** thereby contains process gas undergoing reaction, at about 1650° F. And the third region located immediately downstream of bed **10** within chamber **8** can be assumed to contain process gas at a temperature no greater than 1650° F, since no catalyst is provided within this region. One of ordinary skill in the art would observe that the temperature profile from the first region (~2000° F) to the second region (~1650° F) to the third region (≤1650° F) within chamber **8** progressively decreases. Subsequently, the CO-oxidation catalyst **22** that is located adjacent to chamber **8** will inherently be heated by a corresponding region of process gas, with the temperature of catalyst bed **22** increasing from its upstream side (i.e., adjacent to the third region of about ≤1650° F, and the 700° F inlet stream; column 3, lines 42-44) to its downstream side (i.e., adjacent to the first region of about 2000° F).

Arguments with respect to JAMES et al. in view of FINNERAN, JR. et al.

Beginning on page 7, second paragraph, Applicants argue,

> "Applicants do not contest that the conversion of residual carbon monoxide in two stages with catalysts active at different temperatures is generally known. However, the Examiner does not suggest how the teachings of Finneran would be incorporated in the apparatus of James."

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). Additionally, the test for obviousness is not whether the features of a secondary reference

may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). The teachings of Finneran Jr., et al. would have suggested to one of ordinary skill in the art that modifying the one or more catalyst bed **22** in the apparatus of James et al. to comprise an upstream side portion of different material and activity than the downstream side portion would have allowed a substantial portion of the carbon monoxide to be converted to carbon dioxide, while producing the desirably low levels of residual carbon monoxide in the product gas and a corresponding high degree of conversion to hydrogen, in addition to minimizing the expense of catalyst. (see rejection above).

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
November 4, 2004 JAL

Hien Tran

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PRIMARY EXAMINER